

1 **WE CLAIM:**

1 1. A method of writing product servo sectors to a disk of a disk drive, the disk drive
2 comprising control circuitry and a head disk assembly (HDA) comprising the disk, an
3 actuator arm, a head connected to a distal end of the actuator arm, and a voice coil motor
4 for rotating the actuator arm about a pivot to position the head radially over the disk, the
5 disk comprising a plurality of spiral tracks, wherein each spiral track comprises a high
6 frequency signal interrupted at a predetermined interval by a sync mark, the method
7 comprising the steps of:

8 (a) using the head internal to the disk drive to read the spiral tracks to generate a read
9 signal;

10 (b) processing the read signal to detect a sync mark in a spiral track and generating an
11 associated sync mark reliability metric, wherein the sync mark reliability metric
12 representing a probability that the sync mark was detected accurately;

13 (c) generating a timing recovery measurement in response to the detected sync mark and
14 the sync mark reliability metric;

15 (d) synchronizing a servo write clock in response to the timing recovery measurement;

16 (e) processing the read signal representing the high frequency signal in the spiral track to
17 generate a position error signal (PES) used to maintain the head along a substantially
18 circular target path; and

19 (f) using the servo write clock and the head internal to the disk drive to write the product
20 servo sectors along the circular target path.

1 2. The method as recited in claim 1, wherein the step of generating the sync mark reliability
2 metric comprises the steps of:

3 (a) processing the read signal to generate an estimated data sequence; and

4 (b) correlating the estimated data sequence with a sync mark pattern.

- 1 3. The method as recited in claim 1, wherein the step of generating the sync mark reliability
2 metric comprises the steps of:
3 (a) rectifying the read signal; and
4 (b) generating a DC component of the rectified read signal.
- 1 4. The method as recited in claim 1, wherein the step of generating the sync mark reliability
2 metric comprises the steps of:
3 (a) sampling the read signal to generate a sequence of read signal sample values;
4 (b) processing the read signal sample values to generate expected sample values; and
5 (c) generating a mean squared error (MSE) of the difference between the expected
6 sample values and the read signal sample values.
- 1 5. The method as recited in claim 1, wherein the step of generating the sync mark reliability
2 metric comprises the steps of:
3 (a) rectifying the read signal;
4 (b) integrating the rectified read signal; and
5 (c) generating the sync mark reliability metric and the PES from the integration.
- 1 6. The method as recited in claim 1, wherein the step of generating the timing recovery
2 measurement comprises the steps of:
3 (a) comparing the sync mark reliability metric to a threshold;
4 (b) if the sync mark reliability metric is above the threshold, generating the timing
5 recovery measurement in response to the detected sync mark; and
6 (c) if the sync mark reliability metric is below the threshold, ignoring the detected sync
7 mark.

- 1 7. The method as recited in claim 6, wherein the step of generating the timing recovery
2 measurement further comprises the steps of:
3 (a) accumulating the consecutive number of ignored sync marks; and
4 (b) if the accumulation exceeds a predetermined number and the sync mark reliability
5 metric is below the threshold, generating the timing recovery measurement in
6 response to the detected sync mark.
- 1 8. The method as recited in claim 1, wherein the control circuitry within the disk drive is
2 used to read the spiral tracks in order to synchronize the servo write clock.
- 1 9. The method as recited in claim 1, wherein an external product servo writer is used to read
2 the spiral tracks in order to synchronize the servo write clock.

1 10. A disk drive comprising:

2 (a) a disk comprising a plurality of spiral tracks, wherein each spiral track comprises a
3 high frequency signal interrupted at a predetermined interval by a sync mark;

4 (b) an actuator arm;

5 (c) a head connected to a distal end of the actuator arm;

6 (d) a voice coil motor for rotating the actuator arm about a pivot to position the head
7 radially over the disk; and

8 (e) control circuitry for writing a plurality of product servo sectors to the disk to define a
9 plurality of radially spaced, concentric data tracks by:

10 using the head internal to the disk drive to read the spiral tracks to generate a read
11 signal;

12 processing the read signal to detect a sync mark in a spiral track and generating an
13 associated sync mark reliability metric, wherein the sync mark reliability
14 metric representing a probability that the sync mark was detected accurately;
15 generating a timing recovery measurement in response to the detected sync mark
16 and the sync mark reliability metric;

17 synchronizing a servo write clock in response to the timing recovery
18 measurement;

19 processing the read signal to representing the high frequency signal in the spiral
20 track to generate a position error signal used to maintain the head along a
21 substantially circular target path; and

22 using the servo write clock and the head internal to the disk drive to write the
23 product servo sectors along the circular target path.

1 11. The disk drive as recited in claim 10, wherein the control circuitry for detecting the sync
2 mark by:

3 (a) processing the read signal to generate an estimated data sequence; and

4 (b) correlating the estimated data sequence with a sync mark pattern.

1 12. The disk drive as recited in claim 10, wherein the control circuitry for generating the sync
2 mark reliability metric by:

3 (a) rectifying the read signal; and

4 (b) generating a DC component of the rectified read signal.

1 13. The disk drive as recited in claim 10, wherein the control circuitry for generating the sync
2 mark reliability metric by:

3 (a) sampling the read signal to generate a sequence of read signal sample values;

4 (b) processing the read signal sample values to generate expected sample values; and

5 (c) generating a mean squared error (MSE) of the difference between the expected
6 sample values and the read signal sample values.

1 14. The disk drive as recited in claim 10, wherein the control circuitry for generating the sync
2 mark reliability metric by:

3 (a) rectifying the read signal;

4 (b) integrating the rectified read signal; and

5 (c) generating the sync mark reliability metric and the position error signal from the
6 integration.

1 15. The disk drive as recited in claim 10, wherein the control circuitry for generating the
2 timing recovery measurement by:

3 (a) comparing the sync mark reliability metric to a threshold;

4 (b) if the sync mark reliability metric is above the threshold, generating the timing
5 recovery measurement in response to the detected sync mark; and

6 (c) if the sync mark reliability metric is below the threshold, ignoring the detected sync
7 mark.

1 16. The disk drive as recited in claim 15, wherein the control circuitry for generating the
2 timing recovery measurement by:
3 (a) accumulating the consecutive number of ignored sync marks; and
4 (b) if the accumulation exceeds a predetermined number and the sync mark reliability
5 metric is below the threshold, generating the timing recovery measurement in
6 response to the detected sync mark.